

Two-Staged Fluidized-Bed Combustor

1. Capabilities

The two-staged fluidized-bed combustor system has been designed for versatile operation that will permit investigation of a wide range of factors involving atmospheric pressure, bubbling-bed technology. Dual beds allow application of two basically different operating condition sets during a single experiment. Past application has involved two-stage operation for metals capture in a low-temperature bed combined with a high-temperature bed in series for high destruction efficiency of simulated organic hazardous waste. The system has the ability to utilize a wide range of solid, liquid, and gaseous fuels, as well as processing surrogate or actual hazardous waste materials for thermal destruction. Operations for this system are covered under a full RCRA RD&D permit allowing test work on real hazardous waste. Associated sampling and analytical facilities allow determination of any solid, liquid, or gaseous specie involved with test work.

2. Size

Internal diameters of the dual beds are 6" and 7", the larger diameter unit being located downstream of the smaller to allow additional gas flow through the second bed while maintaining desirable fluidizing velocity levels. BTU ratings for the units vary with the temperature level to be maintained in each unit but average about 100,000 BTU/hr per unit.

3. Test Requirements

Testing requires set-up of continuous emissions monitors and specialized sampling trains for measuring components under study such as dioxins, metals, or nitrous oxide. One full-time operator is required for the dual-bed system with additional personnel required for specialty sampling operations. Operation of the RCRA flue gas cleaning system (FGCS) is required.

4. Raw Materials Required

Bed materials such as silica sand or alumina are required along with a sufficient supply of fluidizing and combustion air. Fuels such as natural gas and distillate oil are required. Other materials requirements depend upon the details of the experiments to be conducted.

5. Data Produced Per Run

A computerized data acquisition system records outputs from continuous emissions monitors (CO, CO₂, NO_x, O₂, and THC) and temperature levels. Air and fuel flow rates and pressure levels are monitored and controlled manually with automatic safety controls always in operation. Additional data are derived from the specialty sampling trains established for individual experiments.

6. Length of Run

Most experiments are conducted within an eight-hour period. The dual-bed system is normally in continuous operation during a test to maintain stable conditions. Long periods of continuous operation are possible; the system can be operated indefinitely if required.

7. Cost Per Run

Operating costs of approximately \$1200/day include an engineer, a technician, an FGCS technician, and other maintenance and expendable materials. Other services provided by a sampling technician (for non-routine analyses) or materials for special analytical work are not included in this estimate.

8. Contact Person

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